Vietnam's Nuclear Challenges: Developing a Nuclear Programme from Scratch

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In a climate of electrical energy rationing and ever-increasing demand, Vietnam, seeking to diversify its domestic energy supply, is beginning the process of implementing an ambitious nuclear energy programme. As a newcomer to nuclear energy, Vietnam faces many challenges to ensure the establishment of a safe, secure and effective nuclear strategy; a task that requires multiple stakeholders, from government to education, research and industry. Achieving nuclear mastery requires the development of a highly-skilled workforce. With little previous nuclear infrastructure, this is proving a challenging endeavour.

Figure 1: Ninh Thuan Province (red) lies within the South Central Coast region of Vietnam (green)

Vietnam approved its Master Plan for National Power Development in 2011 for the 2011-2020 period, with vision through to 2030. The plan outlined Vietnam's intention to integrate nuclear into its national energy strategy. It was hoped that, by 2030, 10.1% of electricity production would be nuclear-derived.

Two Nuclear Power Plant sites are currently planned for construction at two coastal sites within the Ninh Thuan province, which sits at the tip of the South Central Coast region of the country (figure 1). The first, Ninh Thuan I, is to be built in Phuoc Dinh and will initially house two Russian-built reactors (initially, planned to be VVER-1000, but are reported now to have upgraded to Rosatom's AES-2006 model). Construction at this site was planned to begin in 2014, with commercial operation after 6 years, from 2020. However, Vietnam's Prime Minister, Nguyen Tan Dung, has recently announced a delay in construction, potentially through to as late as 2020. A further site, Ninh Thuan II, is to be developed at Vinh Hai, in an inter-governmental agreement with Japan, using third generation Japanese technology. Construction on this project is also delayed, reportedly indefinitely. The delays signify a fundamental lack of preparedness for such an ambitious nuclear energy programme on the proposed time scale. Numerous reasons for this delay have been cited, most importantly, to ensure the "safety and efficiency" of the project and to implement a more "realistic schedule" of nuclear power development. The problems are largely underpinned by a lack of the required manpower for the operation of such large-scale technical operations.

There are many challenges that a new country going nuclear must overcome. These include the development of nuclear infrastructure, the establishment of a legal and regulatory framework, assurance of sufficient safeguards (in compliance with international recommendations and regulations) and the support of the general public. Post-Fukishima, and in the transboundary context of the ASEAN network, such issues are even more complex. Being naïve to the nuclear field (Vietnam has had a small research reactor based at Dalat since 1984), the difficulties of such issues are heightened by a lack of staff with the required expertise. Hence, Vietnam is looking internationally for guidance, training and best practice.

Vietnam has gone some way to combat the staffing issue: in August 2010, they approved the Project on 'Training and Human Resource development in the Field of Atomic Energy' in August 2010, with USD$143M of capacity-building funds allocated to the project. This was a huge challenge. As of 2012, the industrial nuclear workforce just passed 300 people, with only a third having specialized knowledge in nuclear reactor technology, safety and nuclear power installations. The goal, by 2020, is to train 2,400 undergraduate students, 1,000 technicians, 350 researchers, and to have over 1000 people working in research institutions or assuming management positions in the nuclear field. This is an ambitious target, and Vietnam is exploring many opportunities to achieve this.

Domestically, 6 Universities in Vietnam have been chosen to deliver training in the field of nuclear energy, along with a specialized training centre under Vietnam's primary research and development organisation, VINATOM. The focus of such domestic programs is a flagship 5-years bachelor program and 2-years master program at Hanoi University of Science and Technology. A 2-years master program at Dalat University in nuclear engineering is also receiving heavy investment, promoting the use of the nearby research reactor. The Ministry of Education and Defence offers scholarships to encourage talented Vietnamese students towards the nuclear field and there is persistent communication to the general public to attract people to pursue careers in the field of nuclear power. In a bit to tackle retainment post-qualification, financial incentives are being offered to graduates, scientific staff and lecturers who remain in the nuclear field; incentives are proportional to salary scale, seniority and level of radiation exposure.

Vietnam has a distinct international emphasis on its nuclear training, seeking to source expertise from countries with advanced nuclear power industries. Strong educational and training collaborations have been established with Japan and Russia, and the country is investing in collaborations with a number of other states, including France, Hungary, South Korea and Singapore. With Vietnam's first and second plants using Russian and Japanese technologies, Japan and Russia are hosting Vietnamese students, staff scientists and existing experts for training course: scholarships are on offer for talented students to

train in Japanese and Russian Universities and short courses, lasting on average 6 weeks, offer Vietnam's existing nuclear experts an immersive experience in online power plants. Scholarships for Vietnamese students to study in Russia have been established since 2010, offering year-long intensive classes in the Russian language followed by a further 4 to 5 years of subject-specific training. According to the Ministry of Science and Technology, as of September 2014, 323 students have been sent to Russia to train in the nuclear sciences.

As evidenced in the delay of the nuclear energy programme, there are concerns as to the progress of HR training. Some criticisms target the emphasis on theoretical knowledge over practical training, leaving students unequipped to properly handle the engineering requirements of a power plant. In the wake of Fukishima, it is essential to establish an independent nuclear regulatory authority. In Vietnam, this has not yet been achieved, and it can be argued that a more advanced nuclear educational infrastructure can aid in this process, giving a larger pool of staff with nuclear expertise from which to hire. Unfortunately, these criticisms are only exacerbated by the delay: students will be returning home to Vietnam without a power plant in which they can apply the knowledge they have gained. To combat this unfortunate vacuum, further scholarships are being offered to these returning students to complete higher levels of education.

The rush to become ASEAN's first nuclear state has pushed Vietnam to pursue an ambitious nuclear energy program. Numerous strategies are being implemented to train the required personnel to govern, implement and man such a programme and, despite criticisms, training is progressing. International support will prove vital in training the new industry; indeed, Japan has committed to training 1000 nuclear personnel, as part of its agreement with Vietnam. With more countries exploring the possibility of going nuclear, the international community must be prepared: it is of international responsibility to ensure that non-nuclear states, including Vietnam, have the necessary legal, practical and technical expertise to pursue their nuclear ambitions.